

Set 18: Ionic Nomenclature Part II

Skill 18.01: Be able to identify a polyatomic given its symbol or name

Skill 18.02: Be able to name type III ionic compounds

Skill 18.03: Be able to derive the names of oxyanions

Skill 18.04: Be able to name type IV ionic compounds

Skill 18.05: Be able to write formulas for ionic compounds given their names

Skill 18.01: Be able to identify a polyatomic given its symbol or name (Go to <http://tinyurl.com/19v86m5> to watch a video related to this topic)

Skill 18.01 Concepts

Polyatomic ions are those formed from more than one atom

The names of the following common polyatomic ions MUST BE MEMORIZED.

Common Polyatomic Ions

Ion	Name	Ion	Name
Hg_2^{2+}	Mercury(I)	NCS^-	Thiocyanate
NH_4^+	Ammonium	CO_3^{2-}	Carbonate
NO_2^-	Nitrite	HCO_3^-	Hydrogen carbonate OR bicarbonate
NO_3^-	Nitrate	ClO^-	Hypochlorite
SO_3^{2-}	Sulfite	ClO_2^-	Chlorite
SO_4^{2-}	Sulfate	ClO_3^-	Chlorate
HSO_4^-	Hydrogen sulfate or bisulfate	ClO_4^-	Perchlorate
OH^-	Hydroxide	$\text{C}_2\text{H}_3\text{O}_2^-$ OR CH_3COO^-	Acetate
CN^-	Cyanide	MnO_4^-	Permanganate
PO_4^{3-}	Phosphate	$\text{Cr}_2\text{O}_7^{2-}$	Dichromate
HPO_4^{2-}	Hydrogen phosphate	CrO_4^{2-}	Chromate
H_2PO_4^-	Dihydrogen phosphate	O_2^{2-}	Peroxide
		$\text{C}_2\text{O}_4^{2-}$	Oxalate

Skill 18.02: Be able to name type III ionic compounds (Go to <http://tinyurl.com/19v86m5> to watch a video related to this topic)

Skill 18.02 Concepts

Type III ionic compounds are those that contain a cation and a polyatomic ion in its most common form.

1. The cation is always named first and the anion second
2. A monatomic cation takes its name of the element. For example, Na^+ is called sodium in the names of compounds containing this ion. A polyatomic cation takes its name of the ion. There is only one polyatomic cation you need to memorize, NH_4^+ , ammonium.

3. A polyatomic anion in its most common form takes the name of the anion. The most common form most always ends in –ate.

Skill 18.02 Problem 1

Name the following compounds:
(a) NH_4Cl
(b) NaClO_3
(c) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
(d) $\text{Pb}(\text{CN})_3$

Skill 18.03: Be able to derive the names of oxyanions (Go to <http://tinyurl.com/k6c3n5v> to watch a video related to this topic)

Skill 18.03 Concepts

An oxyanion is a polyatomic ion that contains oxygen. Often oxyanions can contain different numbers of oxygens. For example, ClO , ClO_2 , and ClO_3 are all oxyanions. The most common oxyanion in such a series ends in –ate. The one with one less oxygen than the most common form ends in –ite, the one with two less oxygen atoms than the most common form begins with hypo- and ends with –ite. The oxyanion with one more oxygen than the most common form, begins with per- and ends with –ate. Naming ionic compounds containing oxyanions is summarized below.

Naming oxyanions

Oxyanion	Name	Form
ClO_3^-	Chlorate	Most common
ClO_4^-	Perchlorate	Contains one more oxygen than the most common form
ClO_2^-	Chlorite	Contains one less oxygen than the most common form
ClO^-	Hypochlorite	Contains two less oxygen atoms than the most common form

Skill 18.03 Problem 1

The most commonly found ion containing sulfur and oxygen is SO_4^{2-} . Based on this information name the following:			
(a) SO_4^{2-}	(b) SO_2^{2-}	(c) SO_3^{2-}	(d) SO_5^{2-}

Skill 18.04: Be able to name type IV ionic compounds (Go to <http://tinyurl.com/lbz2jo7> to watch a video related to this topic)

Skill 18.04 Concepts

Type IV ionic compounds are those that contain a cation and an oxyanion whose name is derived from the most common form of the oxyanion.

Skill 18.04 Problem 1

Name the following compounds:
(a) Na_2SO_2
(b) KH_2PO_3
(c) $\text{Fe}(\text{MnO}_3)_3$
(d) Na_2SO_3
(e) CsClO_4

Skill 18.05: Be able to write formulas for ionic compounds given their names (Go to <http://tinyurl.com/kcboxpa> to watch a video related to this topic)

Skill 18.05 Concepts

To writing formulas for ionic compounds from their name following the steps outline below

1. Write the symbols for each element or polyatomic ion
2. Determine charges on each element or polyatomic ion
3. Cross over the charges. The absolute value of each ion's charge is the subscript on the ion.
4. Check subscripts and divide them by their largest common factor to give the smallest whole-number ratio of ions
5. Check to make sure the compound is neutral.

Example:

Write the chemical formula for aluminum oxide

1. Write the symbols for each element:

Al O

2. Determine charges

Al³⁺ O²⁻

3. Cross over the charges. The absolute value of each ion's charge is the subscript on the ion.

Al₂O₃

4. Check subscripts and divide them by their largest common factor to give the smallest whole-number ratio of ions

5. Check to make sure the compound is neutral.

$$2(3) + 3(-2) = 0$$

Skill 18.05 Problem 1

Write the formulas for the following

(a) ammonium nitrate

(b) iron (III) perchlorate

(c) Iron (II) oxide

(d) Sodium nitrite

(e) Silver chloride

(f) Zinc sulfate